



Conserve O Gram

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Datalogger Applications In Monitoring The Museum Environment

Advances in computer and electronic technologies have added new, affordable environmental monitoring instruments to the tool chest of curators, collection managers, conservators, and others concerned with the preservation of museum collections. These devices that depend on electronic sensors to monitor and record data (e.g., temperature and relative humidity) can supplement and, in certain circumstances, replace thermometers, hygrometers, and hygrothermographs in the monitoring of environmental conditions in exhibit and storage spaces and display cases. See the *NPS Museum Handbook*, Part I (Rev 9/90), Chapter 4, for guidance on monitoring the museum environment.

Datalogger is the general term given to this new generation of monitoring tool. The term refers to a wide range of instruments designed to perform a variety of data gathering and recording functions. The more complex and expensive dataloggers are able to monitor numerous locations, control HVAC systems, and provide alarm functions and real-time (actual, at the moment) digital readouts. The less complex dataloggers are small, self-contained, battery-operated instruments whose cost is comparable to that of high-quality hygrothermographs. This *Conserve O Gram* discusses only these self-contained instruments and their applicability to the needs of park museum collections.

Self-contained Dataloggers

Dataloggers manufactured by a few companies are available in the United States. The self-contained instruments most widely used in museums are manufactured by ACR Systems, Inc. A newer datalogger manufactured by Ryan

Instruments is battery-operated and provides both real-time digital readout and data storage functions; however, it has not yet been tested by the National Park Service. While some of the following discussion applies to all self-contained dataloggers, the details, unless otherwise stated, apply only to the models manufactured by ACR Systems.

Data Sampling

The ACR datalogger is powered by a lithium battery that has a life of about ten years and can be replaced by the manufacturer. The unit has a memory capacity of 32,000 readings. The actual length of time that it records without overwriting the previously used memory depends on the sampling interval selected by the user. Nine intervals between eight seconds and thirty minutes are available. A datalogger with a temperature and relative humidity (RH) sensor sampling once every eight seconds will begin to overwrite in about 36 hours; however, with a sampling interval of 30 minutes, the memory will store readings for almost one year.

Data Retrieval

The information stored in dataloggers is retrieved through the use of proprietary software that runs on an IBM PC or compatible computer. The ACR models are downloaded directly via a cable to a serial port on the computer. With additional hardware, these instruments can be downloaded from remote sites via telephone lines. The Handwell Monitor, manufactured by Exeter Environmental Systems of England, is capable of downloading information via infrared or radio signals. This

allows retrieval of information from dataloggers placed in exhibit cases without having to open the cases.

Data Manipulation and Output

The software processes raw data and allows the user to produce customized time/date-based graphs on screen and in print. Unlike a hygrothermograph, where a graph depicts either a day, a week, or 30 days, datalogger software provides almost unlimited flexibility in the production of graphs. For example, data from a datalogger placed in a remote park location for a year could generate graphs that show both yearly cyclical fluctuations in temperature and relative humidity and graphs that focus on particular weeks or days.

Graphs can be created that incorporate data from multiple dataloggers. This feature is useful if, for example, one wants to compare contemporaneous data from a number of rooms in a historic furnished structure or multiple exhibit cases in a gallery.

The size and shape of the graphs can be manipulated, as can the X (time/date) and Y (temperature/RH) axis. The graphs can be printed in either landscape or portrait orientation. Labels, comments, and time of day can be added to any point on the graph line. The software also has a statistical function that provides mean, median, high, low, range, variance, and standard deviation statistics for any graph displayed on the screen.

The quality and detail of the printed graphs vary according to the type of printer used. The best-quality, most highly detailed graphs are made with a plotter, a type of printer designed for computer drafting. However, serviceable images also can be produced by a standard dot-matrix or laser printer.

In determining whether the use of dataloggers is desirable, one should consider the following advantages and disadvantages.

Advantages of Electronic Data Collection

- Site staff need not be involved in data collection and evaluation. This feature facilitates collection in remote or infrequently visited locations, locations difficult to access (e.g., exhibit case), or microenvironments (e.g., storage cabinet) to avoid disturbing the environment.
- Electronic sensors are more accurate than traditional mechanical sensors.
- Electronic sensors require less frequent calibration than traditional organic RH sensors (e.g., hygrometers and hygrothermographs using hygroscopic material such as hair). The polystyrene RH sensors used in dataloggers are chemically stable and are not affected by airborne dust. They will drift less than 2% per year under normal circumstances. (**NOTE:** ACR dataloggers can be returned to the distributor for calibration or they can be calibrated in the field using the adjustment feature of the software.)
- The small size of the dataloggers—the ACR unit measures 82mm x 60mm x 15mm (3½" x 2-3/8" x ½")—allows their inconspicuous placement in exhibit cases and historic furnished interiors.
- The units are battery operated; therefore they require no external power source or mechanical winding.
- Graphs can be customized to meet particular needs and for specific applications. This feature facilitates the evaluation of data.

Disadvantages of Electronic Data Collection

- The initial cost, that includes one datalogger and the software, is higher than for similar mechanical equipment capable of similar data collection. (Once software is in hand,

however, only additional dataloggers need be purchased at less cost than the initial package.)

- There is difficulty in getting on-the-spot, real-time readings.
- As with mechanical devices, inaccuracies in readings will result if the datalogger is placed in direct sunlight.

Sources

The following are four distributors of ACR dataloggers. Prices may vary among suppliers. Some suppliers offer a free demonstration disc and free trial usage.

Herzog/Wheeler and Associates, 430 Oak Grove, Suite 311, Minneapolis, MN 55403, (612) 870-4555.

Cascade Group, Inc., 68 West Main Street, Oyster Bay, NY 11771, (516) 624-9363.

Controlyne, Inc., 25 No. Fullerton Avenue, Montclair, NJ 07042-3412, (201) 746-8900.

Giffords Services, 61 Brightside Avenue, Central Islip, NY 11732, (516) 234-1350.

The following companies manufacture and sell other brands of dataloggers:

Exeter Environmental Systems (Hanwell Monitors), Oriel House, 135 Topsham Road, Exeter, Devon EX2 4RE, England, phone: 0392-426810.

PRG (Ryan Instruments), P.O. Box 1768, Rockville, MD 20849-1768, (301) 309-2222.

Alan Levitan
Furniture Conservator
Division of Conservation
Harpers Ferry Center
National Park Service
Harpers Ferry, West Virginia 25425

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